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## SARCOMA OF THE THYROID GLAND.\*

BY CHARLES GREENE CUMSTON, M.D.,

of Boston, Mass.

Assistant Professor of Surgical Pathology in the Faculty of Medicine of Tufts  
College, Boston.

IN the recent textbook on pathology by Stengel, as well as the works on surgical pathology by Bowlby and J. Jackson Clarke, only a few lines are devoted to the subject of primary sarcoma of the thyroid gland. The same may be said of the more recent treatises on surgery that have appeared in America, and consequently I hardly feel that an apology is necessary in reporting the following case and considering the subject more fully before you this evening. I may say that my experience in the diseases and surgery of the thyroid gland has been rather considerable, and from personal observation I am positive that sarcoma of this organ is of rare occurrence, the case here related being the only example that I have ever seen.

M. J., aged 47, German by birth, applied at my clinic for treatment for an enlargement of the left lobe of the thyroid gland, in April, 1897. The tumor was about the size of a lemon, was perfectly movable in all directions and moved with the trachea when the patient swallowed.

The patient had noticed the growth for about 6 months before coming under observation. There was nothing in the history worthy of note; the patient had never had typhoid fever nor any infectious disease that could account for the enlargement of the gland. There was no exophthalmos nor lesion of the heart, all the abdominal organs were normal and an analysis of the urine remained negative.

Palpation of the neoplasm showed that it was circumscribed and limited to the left lobe of the gland, and just above could be felt a softer tissue, which was the normal structure of the thyroid. Compression of the neoplasm did not reduce it in size, and no

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pulsation nor murmur could be detected. No fluctuation could be made out so that the venous, arterial and colloid types of goiter could be excluded and a diagnosis of follicular struma was made by exclusion.

As at that time the neoplasm did not produce any discomfort or symptoms of any serious nature, the patient was ordered thyroid extract, the treatment being carried out for 3 months without any particular benefit.

The patient was then lost sight of until the first part of November, 1898, when she again appeared, saying that for the past 10 weeks the tumor had begun to increase in size. Examination showed that the left lobe of the gland had attained the size of an apple; its surface was still quite smooth, and it was movable, showing that it had not contracted any adhesions. The skin covering it was normal, and no enlarged subcutaneous veins were noted. On account of this sudden development in growth we suspected that a malignant transformation had taken place, and operation was advised and accepted.

November 8, 1898, we operated. A long oblique incision was made along the inner border of the left sternocleido-mastoid muscle, and the enlarged lobe of the gland was exposed by a blunt dissection. The superior thyroid artery was found and ligated and the inferior thyroid artery was tied. The neoplasm was then peeled out after all the numerous veins had been ligatured, a stout catgut-ligature was passed through the stump and tied off in 2 parts, and the tumor was removed by scissors. The skin-incision was closed by an intradermic suture and a compression was made over the wound with dry gauze-sponges held in place by a long roller-bandage.

The after-treatment was simple; the dressings were removed on the sixth day, when perfect union of the wound was found, and the patient was discharged 10 days after the operation.

Examination of the neoplasm showed that the capsule of the gland was intact, and the gland appeared uniformly hard. Microscopically we found the typical follicular goiter at the upper part which had become invaded by spindle-cell sarcoma in the septums dividing the vesicles of the gland. A focus of sarcomatous tissue, about the size of a cherry, was found in the lower part of the gland.

As I have said, malignant neoplasms of the thyroid gland are rare, sarcoma being less frequent than carcinoma. The contrary is stated in Park's Surgery, by American authors, but this is erroneous. Lebert was the first to study these growths to any extent, but microscopic examinations are lacking. Luecke, in his work on diseases of the thyroid gland, makes the statement that the histology of the pathologic conditions of this organ are wanting, and to Kauffmann is certainly due the credit for exact histologic research in cases of malignant neoplasms of the thyroid.

Aided by the fact that besides the neoplastic tissue there was also present goitrous formation he proved that sarcoma develops in the septums of the vesicles of the gland and by proliferation destroys the latter by simple pressure-atrophy. Near the neoformed tissue-elements the tissue of the gland becomes changed. There is a generalized and considerable increase in the width of the septums between the vesicles due to an infiltration of sarcomatous cells. That these cells are identical with those of sarcoma is shown by their characteristic shape, and these tracts may easily be followed directly into the foci of neoplastic tissue, and nearer the focus of malignant growth the cell-infiltration in the septums is more marked. The vesicles stop abruptly and are only to be seen, here and there, in an atrophied condition. In certain portions of the gland, more especially at points where there is a less abundant proliferation of sarcomatous elements in the septums, bloodvessels are to be found the walls of which cannot be distinctly defined from the surrounding malignant cell-proliferation as they come in direct contact with them.

The same changes in the gland have also been described by Mueller, but he believes that the starting-point of the malignant cell-proliferation is in the perivascular connective tissue. But in all events, the two authorities just quoted agree on the point that sarcoma of the thyroid develops in the interstitial connective tissue of the gland.

The most frequent types of sarcoma met with are the spindle-cell and the round-cell varieties, but almost all the types have been found and Fränkel has even reported a case of primary melanosarcoma of the thyroid gland. Braun mentions a case of cavernous sarcoma which invaded the trachea, while Hase and Rabé each report similar cases. In Rabé's case death was caused by pleuropneumonia, while part of the trachea was resected along with the neoplasm in Hare's case, the patient being discharged in good condition. In Braun's case metastases in the lungs and lymphatics occurred. Wölfler reports a case of angiocavernous spindle-cell sarcoma of the thyroid

with metastases in the lungs, lymphatics and left iliac bone, and the same authority also mentions a case of giant-cell sarcoma of the thyroid with metastases in the dura mater.

If the epithelium of the thyroid vesicles undergoes a carcinomatous transformation, a condition not frequently met with, we will then have a peculiar condition of mixed neoplastic formation. Kauffmann reports, as an instance of this form of neoplasm, a case of fibro-sarco-carcinoma of the thyroid.

An interesting form is sarcoma ossificans, cases of which have been recorded by Pick and Förster, who found well-developed osseous tissue in sarcoma of the thyroid. Thus, from all that has been said, we may conclude that all varieties of sarcoma may be met with in this organ.

Simple goiter, even in those countries where it exists endemically, rarely becomes transformed into a malignant growth, but it has been asserted that some type of struma must be present in order that carcinomatous or sarcomatous changes can arise. Kauffmann, whose experience is large in the matter, is of this opinion, although in the histories of 10 of his cases the patients could not recall the presence of goiter before the appearance of the malignant growth. He, however, emphasizes the fact that some patients are not aware of the presence of a goiter, and his histologic studies always proved that aside from the malignant tissue never was there any normal glandular tissue present. It may also be said that Friedland has even recorded a case of carcinoma of the thyroid without enlargement of the gland taking place.

Other authorities have upheld that normal thyroid tissue is to be found in cases of sarcoma of the gland, and Leucke is of the opinion that malignant transformation develops as frequently in a normal thyroid gland as in goiter, but the greater number of instances of malignant neoplasms of this organ are, without doubt, met with in countries where struma are endemic, and it is most probable that the presence of a benign pathologic change in the gland is a predisposing cause for the occurrence of malignant

neoplastic formation, although we cannot at the present time exclude as possible the appearance of sarcoma or carcinoma in an otherwise normal thyroid.

In recording the history of a patient we often obtain the statement that traumatism or cold was the productive factor in the appearance of the neoplasm. An injury may, perhaps, be the first cause for the formation of a tumor, and many authorities, among whom so great a man as Billroth is to be counted, speak in favor of such an assumption. Still such a development naturally presumes the presence of a neoplastic germ, of the nature of which we possess but little knowledge as yet, so that no decisive conclusions can be formulated for the present.

A traumatism would, of course, be understood as producing an irritation, the result of which would be the development of the germ, if the above theory be accepted; but then to what could we attribute the malignant neoplasm in those numerous cases in which no history of traumatism is to be obtained? And also, how could we explain the occurrence of carcinoma in one case and sarcoma in another? We must admit that, for the time being, our knowledge is too undeveloped to explain these intimate pathologic processes.

Leucke asserted that he found sarcoma of the thyroid more frequently in young subjects, while Kauffmann is of the opinion that he has met with it more frequently in elderly people, principally between the ages of 50 and 60 years. The majority of writers who have contributed to this subject are of Kauffmann's opinion; and, although in most every other instance, sarcoma may be rightly considered the neoplasm of youth, there are few recorded cases of this neoplasm in the thyroid gland who were not near or over 40 years of age.

The surface of a struma sarcomatosa varies very greatly with the part affected. Sarcomatous infiltration rarely invades the entire thyroid gland, one lobe alone being usually the seat of the disease, Leucke finding the right one most frequently affected, although many cases are on record in which the left or middle

lobe was affected. In some instances all three lobes were involved.

The size of the neoplasm will naturally vary very much according to the case, being all the way from the size of an egg to that of an orange, or a child's head. When of any size, the surface is lumpy and irregular, the consistency being very solid; or pseudo-fluctuation may be present.

When split open the surface of the section is quite characteristic. It is lighter in color than carcinoma, and is very smooth and transparent. Fibrous trabeculæ divide the neoplasm and are very apparent. The capsule of the gland is most always thickened and will consequently offer considerable resistance to the proliferation of the growth, but when the fibrous covering becomes perforated by the neoplastic cell-elements, or by operative interference, the neoplasm will grow exuberantly, extending out and involving the integuments, leading to ulceration, a condition that is often seen following an incision or puncture of the growth by the surgeon.

Extracapsular extension of the growth will usually only arise in an advanced stage, and the neoplasm has a distinct tendency to extend in depth. Asthmatic attacks are in the first place simply due to pressure, and as the growth enlarges dyspnea becomes great. The slightest exertion on the part of the patient may occasion an attack of suffocation, especially if the growth has perforated the capsule of the gland, and has invaded the lumen of the trachea, or, by growing around it, exerts compression, a condition that will soon appear. Dyspnea will then be very considerable, and not infrequently the patient suddenly dies from asphyxia.

The esophagus is similarly affected, and difficulty in swallowing will arise which, in some cases, is more trying to the patient than asthmatic attacks. Here also the disturbances are caused by pressure from the growth or direct invasion of the esophagus itself, the intensity of suffering being in direct relation to the size of the growth and the amount of involvement of the esophagus. Leucke reports a case in which only the smallest bougie could be passed. It must be

noted, however, that these symptoms are not always due to any great size of the neoplasm, but to the manner of its extension, and it is well known that a small tumor may produce more dangerous phenomena than a larger one.

The nerves are often involved in the process, the recurrent being the one most frequently affected, and usually when the growth is situated on one side. Husky or hoarse voice results, due to paralysis of the vocal cord, which can be demonstrated by laryngoscopic examination.

We may also have other symptoms, such as ptosis, exophthalmos, elevation of the local temperature and hyperemia over one side of the face, indicating that the sympathetic is involved; or there may be palpation of the heart or paralysis of one arm due to compression of the nerves by the growth.

The relations and changes of the bloodvessels are of considerable importance. Early in the disease they are often compressed or displaced, but soon the neoplasm will contract adhesions with them, the walls of the vessels are invaded and destroyed, and often an extensive thrombosis of the veins occurs, rendering both circulation and respiration difficult, and after a time a more or less extensive edema of the upper half of the body takes place.

The vascular changes are also interesting, as regards the manner of metastatic extension of the neoplasm. In opposition to carcinoma of the thyroid gland, in which it is usually admitted that metastases take place by the lymphatics, sarcoma is generally thought to extend to distant parts by means of the circulation. Kauffmann records a beautiful instance of embolic metastasis, in which sarcomatous thrombi were found in the inferior thyroid, internal jugular and innominate veins, with tertiary metastases in both lungs. This case also demonstrates that infection can extend by way of the lymphatics, because foci of neoplastic growth were found in the lower cervical and mediastinal glands.

In most cases, however, the lymphatics are not involved, but we should remember that lymphatic extension of sarcoma is possible, and may occur, as in

the case above quoted. Tertiary metastases may occur, and appear relatively early, but they are not generally found, for the simple reason that death overtakes the patient before they have formed. Bircher says that they are most frequently found in the lungs and often in the bones, while rarer sites are the liver, brain, kidneys, salivary glands, skin and muscles.

If any of the above symptoms are present (and they will all be more or less evident in the later stages of the disease) a diagnosis of malignant growth of the thyroid gland is not difficult to make; but in the beginning it is difficult and often impossible. Kocher says that a sudden increase in size of a thyrocele which has been present for some time, but in a stationary state, or which has only grown slowly, is a characteristic symptom of malignant transformation. By growth an increase in the development of tissue is understood, because a goiter may be greatly increased in size by hemorrhage, especially when this takes place into the cavity of a cyst.

This symptom, which Albert designates as truly alarming, will always be noted by intelligent patients. Then, if to the increase in size we add disturbances in respiration and deglutition, which increase commensurately with the growth of the neoplasm, it is evident that we are dealing with a malignant neoplasm or a strumitis.

Neither the shape nor the consistency of the tumor will give any indication as to the malignant nature of the growth, for not only may a simple thyrocele possess an irregular, lumpy surface, but its consistency may become harder from the deposit of lime; and on the other hand a malignant growth may have a perfectly smooth surface, which, even if irregular in the beginning, may become regular later on. The pains due to pressure are an important but not an infallible symptom of malignant disease of the thyroid, because in simple goiter they may be present on account of pressure on the nerves in the neighborhood of the tumor.

In many cases mobility of the tumor when the patient swallows, is of considerable diagnostic value.

Simple goiter moves with the trachea, while a malignant tumor of any size will have become immovable on account of adhesions contracted with the surrounding organs and tissues. A marked development of the subcutaneous veins is certainly a significant symptom when present.

A diagnosis of probable malignant disease can be made if the subject has had a goiter for some time, which suddenly begins to grow steadily, with pain or pressure in part of, or in the entire gland, asthmatic attacks and dysphagia. If we also consider the patient's age, the emaciation and loss of strength, we may conclude positively that a malignant transformation has taken place. Great difficulty may be experienced in the retrosternal type of goiter, which, when malignant change occurs, will give rise to a pericardial exudate or a mediastinal tumor.

In making a differential diagnosis of malignant neoplasm of the thyroid, we need only consider strumitis and parenchymatous and fibrous thyrocele. These two types of goiter differ from malignant growth by their slow development and their mobility. An acute strumitis generally arises after some traumatism or an acute infectious disease. There is always a rise in temperature, the thermometer often reaching  $39^{\circ}$  C., while in malignant disease, or even abscess of the thyroid, it is not apt to attain such a degree. It must be remembered, however, that a sarcoma of the thyroid has been known to become infected by pyogenic bacteria, and will then take on an inflammatory aspect which closely simulates an acute strumitis. Strumitis, following typhoid infection of the gland, may develop rapidly without an unusual temperature, and we removed the thyroid in a young girl with a diagnosis of possible malignant transformation, but microscopically a simple strumitis was found, and a culture of Eberth's bacillus was obtained from the specimen.

The prognosis of struma sarcomatosa is decidedly unfavorable; its progress is rapid, and death usually takes place in 6 or 7 months—often in less time. If the operation can be undertaken so early as in the case here reported, before the neoplasm has extended

beyond the capsule, the outlook is better; consequently an early diagnosis and operation are desirable, because metastasis rapidly ensues after the limits of the capsule are passed and operation is then almost hopeless.

Of the operations that are to be considered, evidentment and extirpation are the first. The operation must be carried into perfectly healthy gland-tissue and structures, so that every particle of the neoplasm shall be removed and recurrence less likely to take place.

Evidement, which at present is abandoned, consists in splitting open the foci of disease and then scraping them clean with the sharp curet. This operation is not advisable in the vast majority of cases, but has been followed by successful results in a case reported by Kocher. He recommends evidentment in those cases in which soft, isolated foci exist in the parenchyma of the gland when the remainder of the tissue appears normal and if the capsule of the gland is not perforated. In spite of the opinion of so great an authority I must say that I condemn this method most emphatically, and believe that total removal is the only method to advise. In most cases this method will not permit of a complete removal and secondary metastasis is likely to follow such a proceeding.

The only proper time for radical cure by extirpation is when the neoplasm is still movable and the capsule of the gland still intact, with complete absence of enlarged lymphatic glands, or other metastases. It is quite true that we can attack the growth when it has spread beyond the gland to a considerable extent, but I doubt very much if the ultimate result will ever really justify such an undertaking. The technic of extirpation of malignant neoplasms of the thyroid is quite the same as that of ordinary goiter. The two important points in the operation are to avoid hemorrhage and to avoid injury to the nerve-trunks, especially the recurrent. Of course there are many unforeseen difficulties that may arise, and in no operation will our technic have to be so varied as in tumors of the thyroid gland.

It is hardly necessary for me to say that in those cases where only one lobe is the seat of the malignant transformation it is all that should be removed, even if goiter is present in the other lobes. I have little to say of the technic recommended by Mayer, which was to dissect out the tumor without attention to hemorrhage, and when this had been done to catch the bleeding arteries at their point of origin and ligate them there. I will only mention for memory the palliative treatment recommended recently by Adenot in cases where the invasion of the neoplasm had extended too far for a radical operation consisting in freeing the trachea by making a section through the middle of the growth with the thermocautery. Such a proceeding would appear to me quite rational when respiratory symptoms are urgent. But the proper manner of proceeding is to detach the growth carefully, ligating all bleeding vessels as they appear and then tie the larger ones when the growth has been freed all about except at its base of attachment. This may be accomplished easily if the anatomy of the region is well known.

The technic, which has been carefully worked out by Kocher, Juilliard, Socin, Reverdin, and Billroth, and greatly simplified, is at present well regulated, and, of all, Kocher's method is probably now the most in vogue. For total extirpation of the thyroid a U-shaped incision is employed, but when only one lobe is to be removed an incision carried along the inner border of the sterno-mastoid muscle on the affected side is sufficient. The superficial fascia and the platysma muscle are first cut through and then the sternohyoideus, sternothyroideus and omohyoideus are severed, which exposes the tumor enclosed in its capsule. The superficial vessels are ligated as fast as they appear and then the superior thyroid artery and veins are tied *en masse*. If the rather inconstant superior accessory thyroid vein be present it should also be ligated.

When all bleeding has been stopped the inferior thyroid artery and vein are found and tied, care being taken not to include the inferior laryngeal nerve in the ligature. The nerve runs somewhat in front and

to the side of the trachea behind the venous plexus covering the posterior aspect of the tumor. This plexus should be ligated as soon as exposed. The best way to avoid injury to the nerve is to carefully expose the artery until the junction of its two principal branches is reached; these branches are then ligated. It is well to remember that there is a network of the sympathetic and the middle cervical ganglion in the neighborhood of the main trunk of the artery.

After all bleeding has ceased the pedicle is transfixed by a pedicle needle and a stout catgut ligature is passed through, the pedicle being tied in two halves. If necessary the wound may be plugged with gauze which is removed in 24 hours and the skin-incision is brought together with a secondary suture.

Much difficulty may be experienced when removing a retro-sternal growth, for as the pericardium and arch of the aorta are in direct relation to the neoplasm, mediastinitis may occur and death is the result.

Tracheotomy as a preliminary proceeding was formerly advised by Roser in extirpation of goiter, in order to prevent mediastinitis, facilitating the operation and dealing with the trachea, but the results were bad, as has been pointed out by Kocher and Wölfler, since infection often took place. It is now no longer resorted to. Narcosis will rarely be difficult if the head be placed in a good position for respiration, even in cases of the so-called suffocating variety of goiter.

Even in the early stage, the malignant neoplasm may have contracted adhesions with or perforated the trachea and esophagus, so that portions of these organs may have to be resected, along with the growth. Resection of the trachea and esophagus has not been resorted to frequently. Braun records 4 cases in which the muscular coat of the esophagus had to be removed; all 4 patients died. Czerny operated on a woman of 50 years, in whom he was obliged to resect 6 cm. of the esophagus involved in a carcinoma of the thyroid. The lower segment was sutured to the skin-incision, as the two ends could not be easily approximated. The patient survived the operation for 3 months.

Injuries to the nerves have a practical importance.

When the neoplasm has involved the nerves they degenerate; the symptoms I have already mentioned.

Section of the recurrent nerve is not fatal, and only produces difficulties in phonation due to paralysis of the vocal cord. If the vagus is injured on one side only, the prognosis is favorable, because the remaining nerve is quite equal to the task of regulating the functions of the heart and lungs, as the experimental researches of Dr. D. Gourfein have amply demonstrated. In his excellent monograph entitled "*Recherches sur la Symptomatologie de la Paralyse unilaterale du Pneumogastrique*," published in 1894, Gourfein concludes as follows:

"A unilateral paralysis of the pneumogastric does not give rise to any pathognomonic symptom, *either in the digestive tract, the lungs or heart*. But there is *one constant and persistent symptom, namely, a change in the voice and an intermediary position of the corresponding vocal cord*. Consequently, clinically, if a patient presents a change in the voice, and if by laryngoscopy there is an intermediary position of the corresponding vocal cord, there *may* exist a unilateral paralysis of the vagus or of its roots, if we can exclude a peripheral lesion producing the same effects. If at the same time there is a manifest paralysis of the crico-thyroid muscle, during crying or phonation, this lesion is probably to be found above the origin of the superior laryngeal nerve. If the sensibility of the mucosa of the upper part of the larynx exists, the upper roots must be excluded as the site of the paralysis, which properly belong to the vagus."

The hypoglossus, which will rarely be involved, causes a paralysis of the tongue-muscles, consequently producing difficulties in mastication, as well as clumsy speech, this being more manifest in the articulation of lingual letters. Disturbances of the sympathetic nerve have already been considered.

The complications following operation are secondary hemorrhage and infection of the wound, as well as the pathologic conditions which follow a total extirpation of the thyroid gland. As to hemorrhage and infection, it may be said that a careful operator will never have to cope with them. There are few cases where

the entire thyroid must be removed, as usually only one lobe will undergo malignant transformation. However, if all 3 lobes are the seat of the neoplasm, nothing is left but the entire extirpation of the organ.

When this has been done, a singular type of cachexia follows, which has been termed operative myxedema by Reverdin, and cachexia strumipriva by Kocher. It begins several months after complete removal of the thyroid, its first symptoms being a sensation of bodily weakness, cold and numbness of the arms and legs, and a clumsy speech. The patients look pale, bloated, and have an idiotic expression. The intelligence and will-power decrease, and in young subjects growth and development are retarded. Tetanus finally appears, and ends the scene. The essential pathologic conditions of the cachexia is, in all probability, a disturbance of the normal brain-functions, anemia, and a rapid collection of mucin in the body.

The therapeutics of this affection is the exhibition of the raw thyroid gland of the calf or sheep, the dose being from 3 to 4 grams once or twice a week. Subcutaneous injections of an alcoholic or a glycerin extract of the thyroid may also be used. Thyroid tablets, if *freshly* prepared, are of value, and are a more elegant preparation, but if we cannot be sure as to the freshness, it is, in my opinion, better to give the raw gland.

In closing, I would say that the great mortality which has followed extirpation of sarcomatous transformation in the thyroid gland, is due simply to the fact that the affection was not recognized early enough so that operation could be of much avail, and the case here reported is one of the earliest extirpations that I have been able to find recorded. The literature on the subject is quite considerable, but on account of want of time I have only been able to consult my own library, the references from which I append, although very far from complete.

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